Remarks

Applicants have amended claim 1 to include the limitation of claim 9.

As indicated in the background of the present invention pearlite is produced from carbon steels containing at least 0.77 wt% carbon. An aspect of the present invention is to form a continuous pearlite layer on an iron article containing less than 0.77 wt% carbon. Applicants achieve the desired result by (a) heating the iron article to convert it from a ferritic structure to an austenitic structure; (b) exposing the austenitic structure to a carburizing atmosphere consisting essentially of CO and 10 to 50 vol% H_2 and (c) then cooling the article to form the pearlite structure.

The Examiner has rejected the claims under 35 USC 103(a) as unpatentable over Ramanarayanan in view of Garg. Applicants respectfully request the Examiner to reconsider and withdraw that rejection.

Ramanarayanan discloses the protective nature of an FeS film formed on steel having a substantially fully pearlitic surface. The preferred steels used by Ramanarayanan are carbon steels, e.g., those containing at least 0.7 wt% carbon and preferably 0.75 to 1.0 wt% carbon (Col. 2, lines 43 to 46). Such steels have a ferrite-pearlite micro structure that can be converted to an all pearlite micro structure by heating above 900°C in a carburizing atmosphere such as methane and hydrogen and after carbonization heating to the austenic recrystallization temperature to form the pearlite layer (Col. 3, lines 1 to 8). Clearly the reference fails to disclose or suggest heating an iron article having less than 0.77 wt% carbon for a time and at a temperature sufficient to convert at least a portion of the article from a ferritic structure to an austenitic structure; and then exposing the austenitic structure to a CO/H_2 environment followed by cooling.

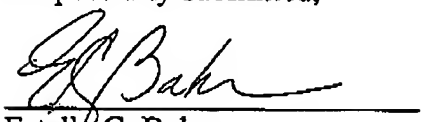
Incidentally, the statement in Ramanarayanan that only the surface layer of the steel need contain more than 0.7 wt% carbon (Col. 3, lines 9-12) clearly supports an unexpected and unobvious feature of applicants' invention. The referenced paragraph clearly would suggest to one with ordinary skill in the art that if you want a surface layer of pearlite you must have greater than 0.7 wt% carbon on the surface of the steel, otherwise the pearlite layer cannot be formed. That is a teaching directly opposite the present invention.

The secondary reference, Garg, fails to make up the deficiencies of the primary reference. As with Ramanarayanan, Garg does not disclose the step of heating an iron material containing less than 0.77 wt% carbon to convert ferrite to austenite and thereafter carburizing the so heated material. The whole tenor of Garg is to provide a gas stream for carburizing carbon steel components. Thus Garg teaches nothing with respect to iron materials containing less than 0.77 wt% carbon. Also, the heating step referred to in Garg (Col. 5, lines 24 to 46) is conducted in the presence of the carburizing atmosphere. Applicants' process requires a first heating step to convert ferrite to austenite followed by a second heating step in the presence of a CO/H_2 mixture.

It might be obvious to try to use the specific carburizing gas mixture of Garg in treating a conventional carbon steel in the method of Ramanarayanan but that fails to render applicants' process of producing pearlite from an iron article containing less than 0.77 wt% carbon obvious.

In view of the foregoing comments and amendments applicants respectfully submit the claimed invention is patentable over the cited art and they request that the case now be passed to issue.

Respectfully submitted,



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☐ Pursuant to 37 CFR 1.34(a)

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